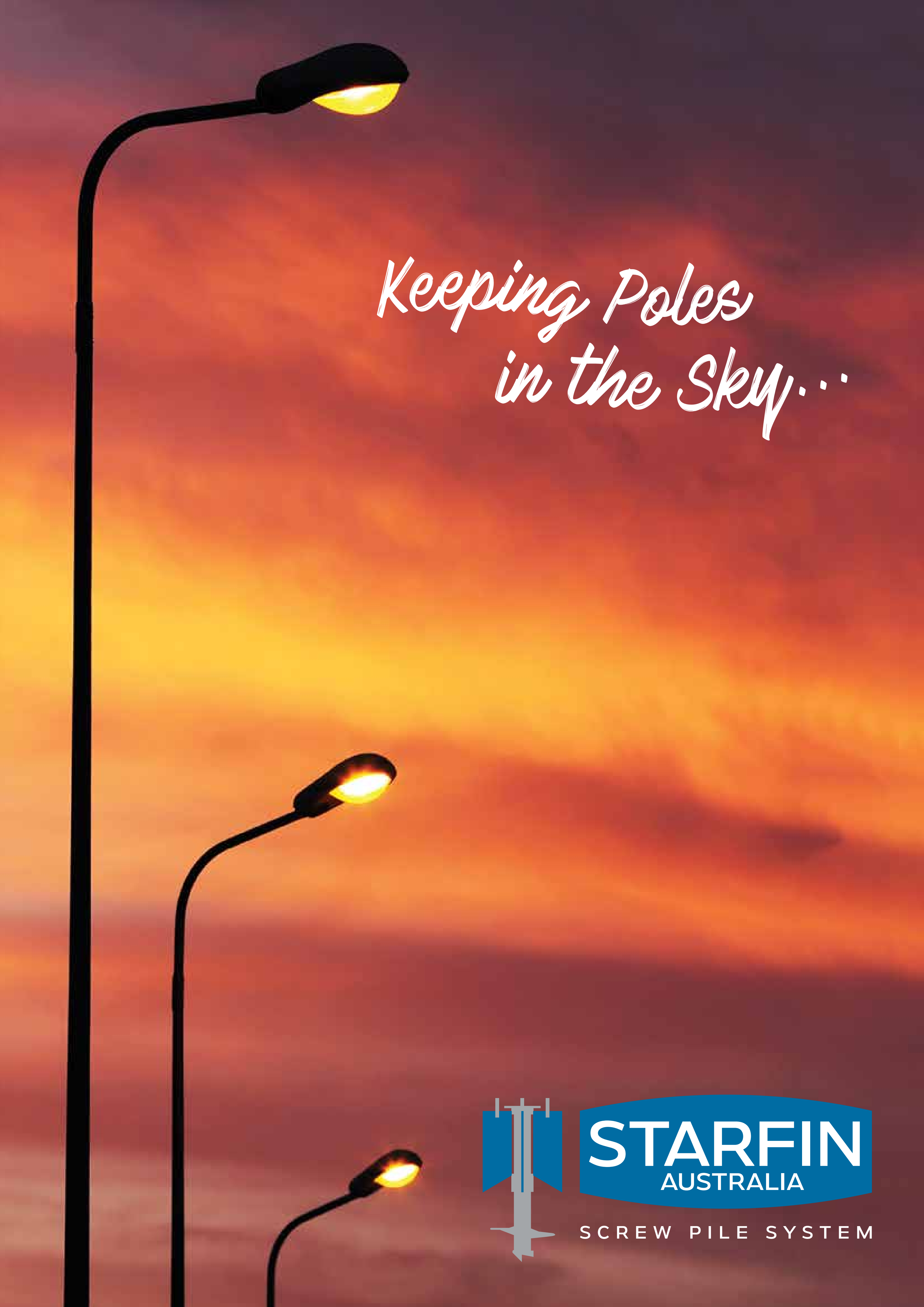

Keeping Poles in the Sky...

STARFIN AUSTRALIA

SCREW PILE SYSTEM

STARFIN
AUSTRALIA
SCREW PILE SYSTEM

MISSION STATEMENT

Starfin Australia prides itself in providing the best possible service, quality product, and value to our customers whilst growing our business into the future.

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CONTENTS

STARFIN AUSTRALIA
SCREW PILE SYSTEM

Starfin Australia stocks and distributes a range of screw pile and bored hole pole foundations systems.

The Starfin Patented designed has been engineered specifically for laterally loaded,non critical structures such as lighting columns, traffic lights and power transmission poles.

The traditional method of boring holes and using steel cages can associate with delays due to weather, curing of concrete and not to mention the elimination of concrete and soil spoils.

The Star Fin System can be installed and ready for use within minutes. Civil contractors will find not only is the system able to streamline their building methods, but greatly reduce overall costs.

There is a total of six (6) models of Starfin screw piles as detailed on Table 1.

The product specification for the Star Finned screw pile has been developed to satisfy the base moment and shear load in soil having an undrained shear strength of not less than 50kpa in accordance with Australian Standards. AS4100-1992 Steel Structures and AS2159-1995 Piling Design and Installation.

Each screw pile model has a different design moment and shear force. The moment is the result of wind load acting on the lighting columns.

The 1CE Starfin has 3 fins, whist the remaining screw piles have a total of four fins. Each screw pile model is designed to support a lighting column over its design life without catastrophic failure or excessive deflection even in poor soil.

The Star Finned screw pile is installed by a hydraulic rotary drive and is screwed into the ground to its design length.

The fins are free to rotate as they are dragged vertically into the ground with the shaft.

There is a power cable slot in all starfins to allow for easy installation of power.

TABLE 1

STARFIN SERIES	BASE MOMENT	SHEAR
	ULS kNm	**ULS** kNm
1CE	12	3.5
2B	17	4
3B	32	6
4A	39	7
5A	70	10
5B	80	14

ENGINEERED POLE FOUNDATION SYSTEM

DESIGN PHILOSOPHY

Under ultimate limit state, the star finned screw piles are designed to avoid catastrophic failure under the ultimate design wind load. Fatigue failure of the pile is considered in the design.

Highway lighting columns incorporating a slip base are connected to a specifically designed slip plate attached to the series 3B screw pile. This is designed to allow slip failure at the columns base/slip pate interface to occur with minimal or no load transferred to the screw pile foundation.

Design Model

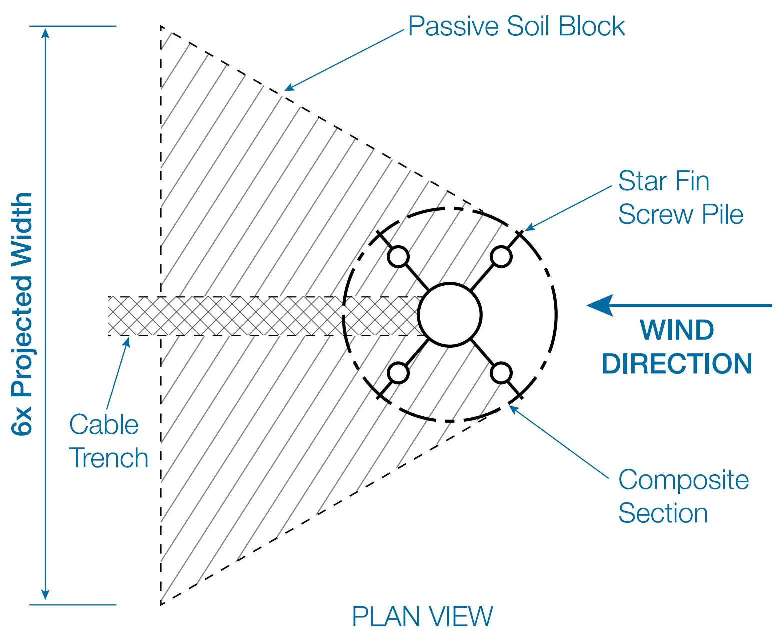
The method of analysis proposed for the design model was developed from the results of numerous field tests.

Upon lateral loading of the lighting columns, the star finned screw pile is subjected to an instantaneous wind load applied bending moment at the ground surface.

The moment is then transferred into the composite section of the pile which comprises the fins, hold down bolts, and the centre shaft. The stiffness of the composite section is approximately 50% more than the centre shaft stiffness alone.

The applied load is a transient load and the soil can be assumed to be an undrained state. This results in high passive resistance around the mobilised fins, as the passive resistance is a function of the undrained shear strength (rather than a function of the overburden pressure as in the drained case). The magnitude of this pressure resistance is also a function of the effective width of the star finned screw pile. This effective width is six (6) times larger than the projected fin width (as shown in diagram below).

This larger passive restraint also provides overall stability to the system. The applied moment is rapidly dissipated through this composite section by passive resistance of the soil surrounding the fins.



PLAN VIEW

GEOTECHNICAL CONSIDERATIONS

General

The performance of the star finned screw pile involves a complex soil/structure interaction. The geotechnical considerations which need to be addressed are:

- Shear strength of the soil surrounding the fins and shaft;
- Presence of hard layers at shallow depth;
- Piles in sloping ground;
- Soil loss around fins/reactive clay soil; and
- Soil disturbance due to trenching works.

It should be noted that these considerations are applicable to all piling types resisting lateral loads.

The lateral capacity of the star finned pile system is considered to be high when compared to uniform concrete or steel shaft piles.

The orientation of the four fins is such that a larger passive wedge of soil is mobilised in front of the fins. Piles extracted after testing by excavation were found to have a cylinder of compacted soil around the shaft.

We consider that this is probably due to the result of of the soil being compacted between the helix and the fins during installation, as the pile installation is a displacement process. This 'equivalent pile diameter' should also increase the geotechnical capacity of the finned pile system.

Shear Strength of Soil

Critical design loading on the finned piles is the result of an instantaneous wind gust. Under wind load conditions the soil response should be in an undrained condition for both cohesive and cohesionless soils. The field trials have been carried out in soils with an undrained shear strength of at least 50kPa.

If the fins are installed in soils with undrained shear strengths less than 50kPa, then the deflections of the system under wind load may exceed the elastic limit of the soil.

If the fins (or any other pile system) are installed in soft to very soft (say Cu <20kPa), then ultimate rotational failure and excessive non-recoverable deflections may occur.

If it is necessary to install lighting colmns over soft ground, then a site-specific star finned screw pile system could be designed.

This may include deeper fins and a longer shaft than those provided for that standard pile series, or the deisgn of a pile group.

In the event that non-recoverable deflection of the foundation and lighting column occur, the column can be re-leveled using the leveling bolts provided on top on the fins.

If the deflections are such that they exceed the limitations of the leveling bolts, then a jacking system can be used to straighten the pole and foundation.

This may include installing a temporary finned pile adjacent to the foundation of concern and jacking the pole back into its original position.

Pile penetration Lengths

The piles need to be installed to their design length with the fins fully submerged in soil. This is to ensure global stability and to fully dissipate the applied moment and shear force down through the fins and shaft. If a hard layer or weathered rock is encountered above the design founding level, then pre-boring may be required.

Sloping Ground

The passive resistance of soil is reduced when the ground falls away from the pile.

In the case of star finned screw piles supporting lighting columns with a high bending moment and minimal shear, the pile will tend to be rotated down into the ground rather than deflected laterally.

This behaviour was observed during field trials. In additonal there are four fins resisting the applied force, thus at least two fins will be on the 'uphill side' of the pole where full passive resistance can be assumed.

We consider that the finned piles installed on sloping ground, the lateral capacity should not be adversely affected for slopes up to 1V:3H. For piles installed in steeper sloping ground, other than rock slopes, increased fin length would be required to provide equivalent lateral capacity.

Soil Loss Around Fins

The star finned pile system relies on soil around the fins immediately below ground level to provide passive resistance. It is normal practice to ignore the upper 600mm to one pile diameter to allow for soil loss due to erosion and reactive clay shrinking away for the pile. Most of the light poles will be installed adjacent to road pavements or footpaths with a sealed surface.

This protection system should eliminate erosion and minimise soil moisture content change. For those finned piles installed where no surface protection system is provided, an assessment of the potential for soil loss around fins should be made.

In clay soils in low to moderate plasticity, both erosion and shrinkage should not occur. In cohesionless soils on gentle slopes with an adequate shear strength erosion should not occur.

In steep sloping sites with cohesionless soils, and on reactive clay sites, some form of protection to minimise soil loss would be necessary. This may include using coating with geo-fabrics around the fins, a concrete pad around fins or replacing clays with compacted granular fill.

Soil Disturbance Due to Trenching Works

After the star finned pile is installed it is necessary to then excavate a narrow trench in front of the fins to install the electrical cable. The presence of the cable slot is common to any foundation system for a lighting column.

The backfilled cable trench should not adversely effect the performance of the star finned screw pile system due to the width of the fins and the large soil mass mobilised in front of the fins under wind loading.

In some cases there may be larger backfilled service trenches near the pile foundation.

We consider that the presence of these trenches should not adversely effect the behaviour of the foundation provided that they are backfilled with compacted fill.

The Copper Grounding Rod and the in Ground Star Fin Screw Pile

If the steel and copper are electrically connected and immersed in an electrolyte (wet soil is an example) a galvanic cell is set up to the dissimilar metal couple.

The steel becomes anodic and an oxidative process (corrosion) takes place in the steel surface.

The copper becomes cathodic and a reductive process takes place at the copper surface.

The standard electrode potentials are often quoted for the two metals and the resulting 0.78 volts given as the cell driving force.

$Fe\ Fe^{2}_{+} + 2_{+} = 0.44V$

$Cu^{2}_{+} + 2_{+}\ Cu = 0.34V$

$Fe + Cu^{2}_{+}\ Cu + Fe^{2}_{+} = 0.78V$

This is an over simplification as this is only true if the copper is immersed in a copper containing electrolyte.

In soil the actual electrode process of the copper surface will be in either oxygen reduction or hydrogen evaluation.

Even though copper surfaces have a high affinity for oxygen the voltage or a cell generated is never likely to exceed 1.5V and would rarely approach this figure.

The problem is avoided if the star finned screw pile is electrically insulated from the copper earthing rod or the light pole's base plate.

Since the insulation only has to break the galvanic circuit it is only required to insulate against the 0.78V expected as maximum in the cell.

Stray Current Corrosion

Stray current effects and galvanic effects are a completely different phenomena. Stray current corrosion occurs in buried steel which is close to D.C. electrical currents.

The induced currents in the steel can lead to the set up of corrosion cells.

In the case of the star finned screw pile the copper earth rods earths a A.C. system so stray current is not an issue.

STAR FINNED SCREW PILE DURABILITY

Design Life of Star Finned Screw Pile

The design life of the pile has been assessed based on the recommendations in Section 6 of AS2159-1995. The presence of the cable slot and open-ended shaft will allow corrosion to occur from the internal surface. In assessing the design life, corrosion on both the internal and external surface was allowed for.

The rate of corrosion will be dependant on the type of soil that the pile is installed in and only the presence of transient groundwater. Classification of soils from non-aggressive to severe is given in AS2159-1995. For the purpose of this report, only non-aggressive, mild, and moderately aggressive soil types are considered.

Corrosion will increase and reach a maximum at about 10 to 15 years for moderate to non-aggressive soils respectively. Results of research have concluded that maximum corrosion rates of unprotected steel piles embedded in soils is about 0.02mm to 0.03mm a year. Based on this, the following design lives were estimated for particular soil types as a guide. The corrosion rates given represent the estimated rate at and immediately below the ground surface.

Galvanised Product

SOIL CONDITION	ASSUMED UNIFORM CORROSION ALLOWANCE (MM/YR)	ESTIMATED TOTAL DESIGN LIFE (YEARS)
Non-aggressive	0.005	>60
Mild	0.015	40-60
Moderate	0.03	25

Severe to very severe exposure classifications are limited to piles in seawater. We have therefore not considered this corrosion condition. If it was found to be necessary to install the piles in such ground, modification to the standard design may be adopted.

Modifications could also be included for less severe corrosion conditions if longer design life than those given above are required. These modifications may include:

- Double corrosion protection with an inert coating
- Cathodic protection

Maintenance of Star Finned Screw Piles

It is considered that the most critical portion of the pile susceptible to corrosion is the portion at and immediately below the ground surface. For the star finned screw pile system, this would include the hold down bolts to support the lighting column and the top portion of the fins.

It would be more effective and practical to adopt a long term maintenance program for the star finned screw piles. This would involve simple visual inspection of the critical areas of the piles at intervals dependant on the aggressiveness of the soil. If deterioration of the hold down bolts is observed they can be replaced without removing the lighting column.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TECHNICAL INFORMATION

STARFIN SERIES	BASE MOMENT	SHEAR	CHS SHAFT		WEIGHT	HOLD DOWN BOLTS 8.8/S				INSTALL DRIVE	CABLE ENTRY
	ULS kNm	**ULS** kNm	**Dia** mm	**Length** m	kg	**No.**	**Dia** mm	**L** mm	**PCD** mm		**Size D/W** mm
1CE	12	3.5	76.1	1.2	33	3	M20	230	210	75mm Square Kellybar	120”40
2B	17	4	88.9	1.5	38	4	M20	230	350	80NB Table E Flange	80”40
3B	32	6	114.3	1.5	66	4	M24	230	350	100NB Table E Flange	100”50
4A	39	7	168.3	1.5	92	4	M30	280	350	150NB Table E Flange	100”50
5A	70	10	219.1	2.4	178	4	M36	280	500	200NB Table E Flange	100”50
5B	80	14	219.1	2.4	217	8	M30	280	500	200NB Table E Flange	100”50

Standard Engineering Specification

All lighting columns are to be supported by a steel screw piling system designed and certified in accordance with AS4100 and AS2159.

The screw piling system supporting the specified lighting columns must be capable of achieving the following design parameters.

Ultimate moment capacity kN/m (refer to table on technical drawing or product specification table).

Ultimate sheer capacity kN (refer to table on technical drawing or product specification table)

The screw piling system is required to be fitted with replaceable hold down bolts attached to the screw pile assembly to enable adjustment of the lighting columns for vertical tolerance.

The central shaft and welded figments are to be capable of withstanding the required installation torque without deformation.

The screw pile is to incorporate at least one (1) base helix and a base mounted point attack bit to centralise the screw pile during installation. (The shaft cut at a 45° angle will not be accepted.)

A reinforced cable entry slot of sufficient size to accommodate the specified electrical conduct is to be provided. The cable slot entry is to be a minimum of 400mm in depth from the finished ground surface after installation.

A drive plate is to be provided welded to the top of the screw pile shaft subject to safely engage the installation equipment and capable of withstanding the required installation torque. The installation drive plate is to be utilized to connect the screw pile to the lighting column.

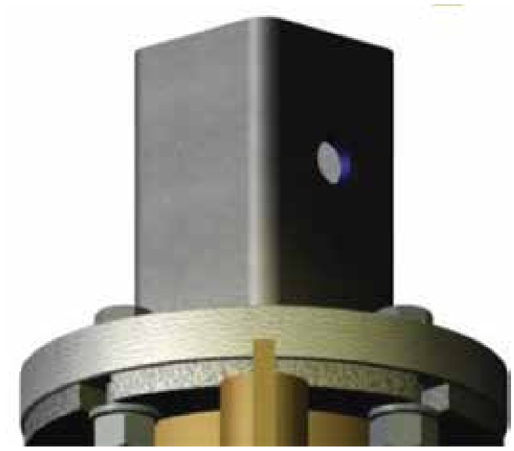
The design of the screw piling system is to be such that the screw pile is prevented from unwinding in the ground after installation.

Written certification by a registered professional engineer is required stating compliance with the relevant design parameters and compliance with the relevant code.

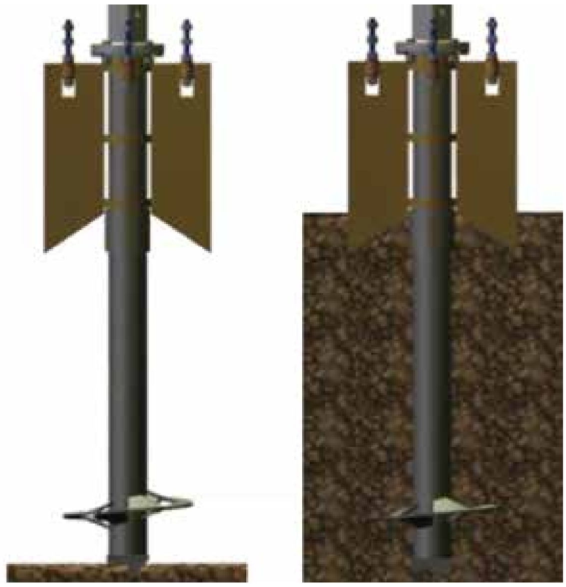
PRODUCT INSTALLATION

Method Statement

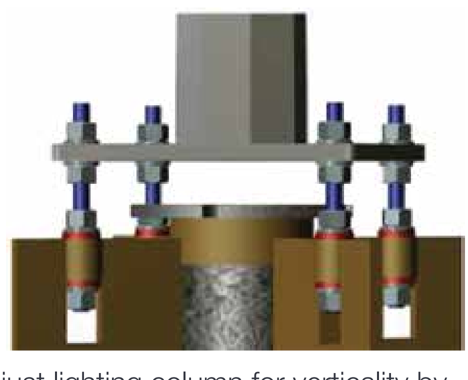
- Check drive tool for wear. If worn replace.
- Check the installation location for known underground services. If service location are unknown, careful pre-boring with an earth auger or hand digging will discover services.
- Set out location of the screw pile, establishing location of junction box and final pole orientation.
- In hard clay soils or shale, pre-auger soil with an earth auger (refer to the schedule on page 13) to full pile depth and reverse auger out of hole, ensuring minimal soil removal.
- During screw pile installation the helix rotation will pull the fin assembly into the ground vertically. Once the fins have engaged the ground they must not be allowed to spin during installation.
- Install the screw pile until fins are touching the ground, rotate the fins to the correct location and continue installation until pile is fully installed.
- When final depth is achieved, ensure cable slot "V" indicator is pointed towards junction box.
- Ensure that a fin plate is not blocking the cable entry slot.
- Stand up lighting column and fix to hold down bolts, adjust nuts to level column.
- Vermin protection may be carried out by using expanding polyurethane foam. Fill in the gap between the light pole base plate and screw pile drive plate.



1. Attach drive tool, ensure bolts are secure



2. Stand Star fin vertically & install
3. Ensure fin plates do not rotate during installation



4. Adjust lighting column for verticality by adjusting nuts

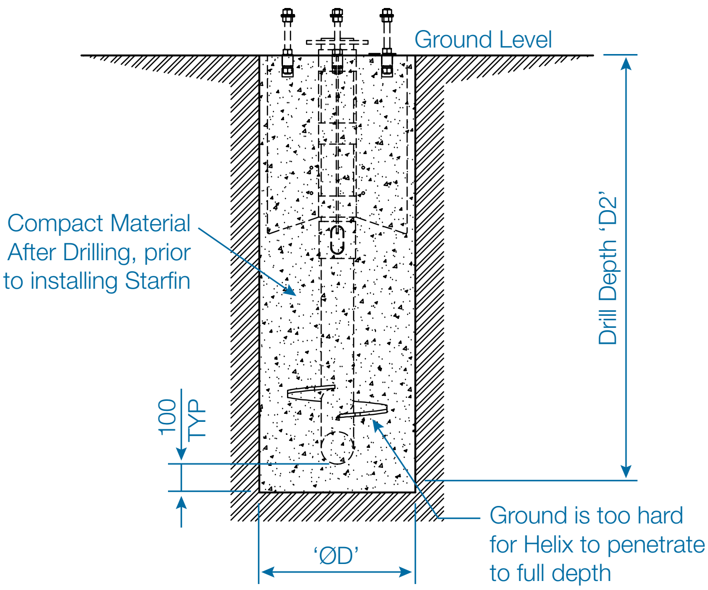
STARFIN PRE-DRILLING PARAMETERS SCHEDULE

STARFIN SERIES	ULTIMATE CAPACITY		MAXIMUM INSTALLATION TORQUE	OVERALL FIN WIDTH 'F'	DRILL DIA 'ØD'		MIN. DRILL DEPTH 'D1'	MIN. DRILL DEPTH 'D2'
	MOMENT	SHEAR			MINIMUM	MAXIMUM		
	kNm	kNm		mm	mm	mm	mm	mm
1CE	10	3.5	8000	289	Ø350	Ø400	655	1550
2B	17	4	12500	467	Ø500	Ø550	670	1550
3B	32	6	22000	493	Ø550	Ø600	730	1550
4A	39.2	7	45000	554	Ø600	Ø650	730	1900
5A	70	10	90000	649	Ø700	Ø750	870	2550
5B	80	14	90000	649	Ø700	Ø750	870	2550

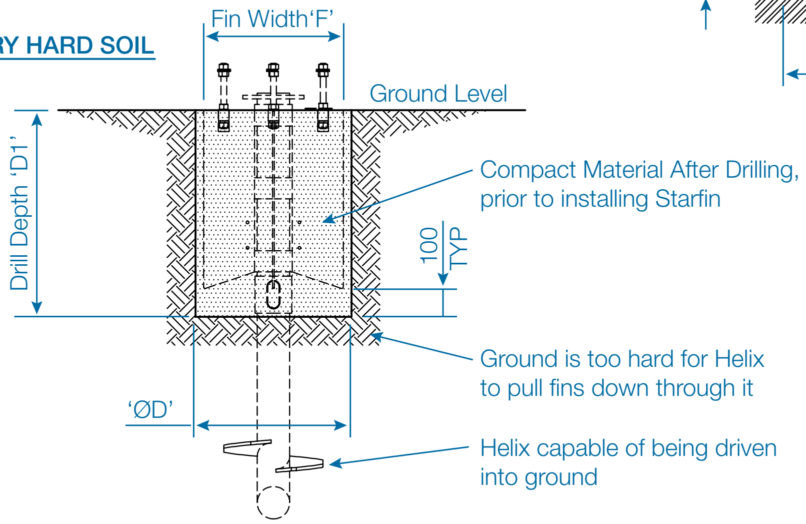
DRIVE AUGER IN AND
DRIVE AUGER OUT

DON'T PULL AUGER OUT!
AUGER NEEDS TO BE REVERSED LEAVING ALL MATERIAL IN THE HOLE

VERY HARD SOIL TO SOFT ROCK



HARD TO VERY HARD SOIL



Notes

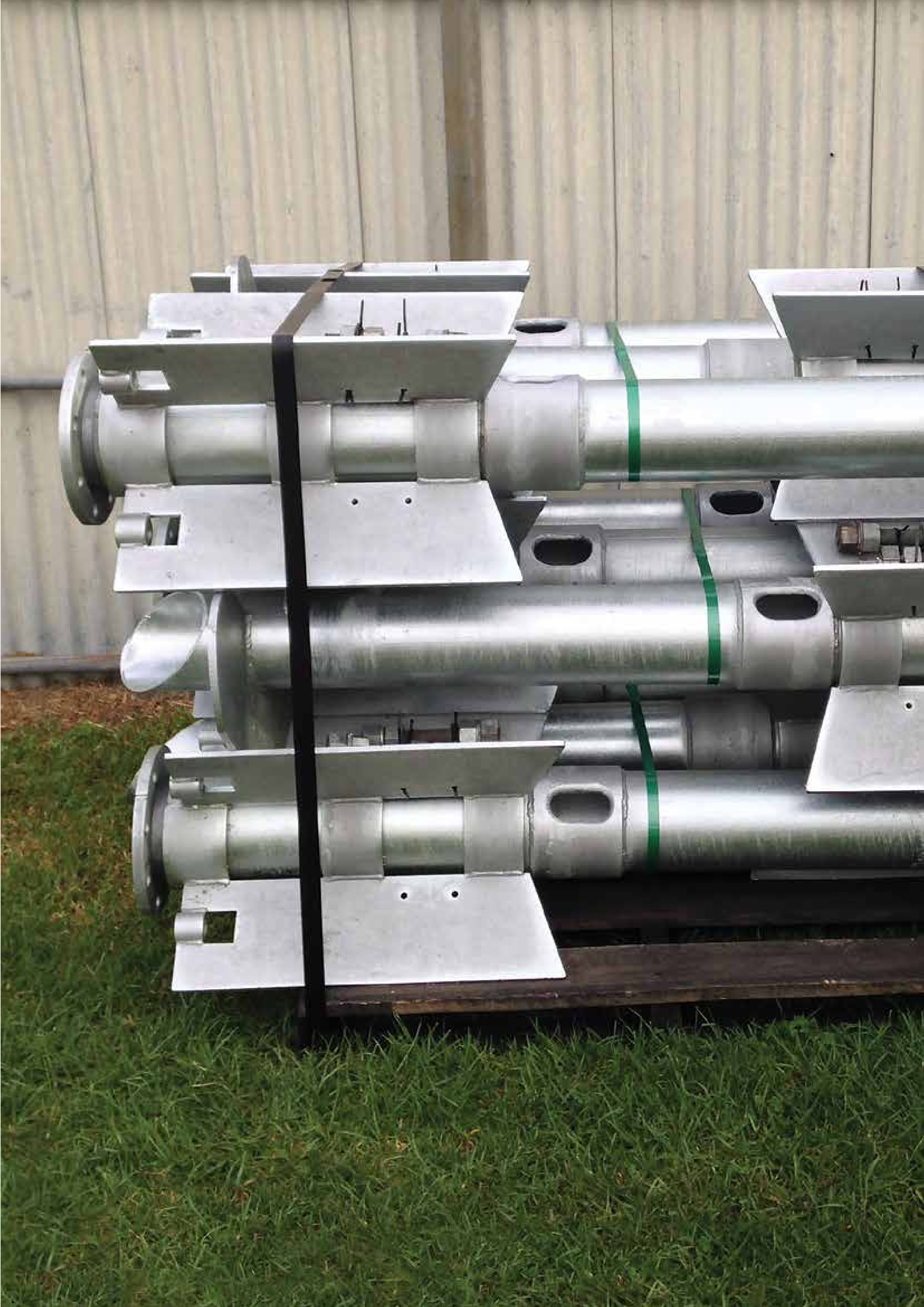
- The purpose opre-drilling is to break/loosen the ground up enough to allow the helix to pull fins down through the ground.
- All soil must remain in the pre-drilled hole and compacted to suit.

INSTALLING STAR FINNED SCREW PILES ON SITE

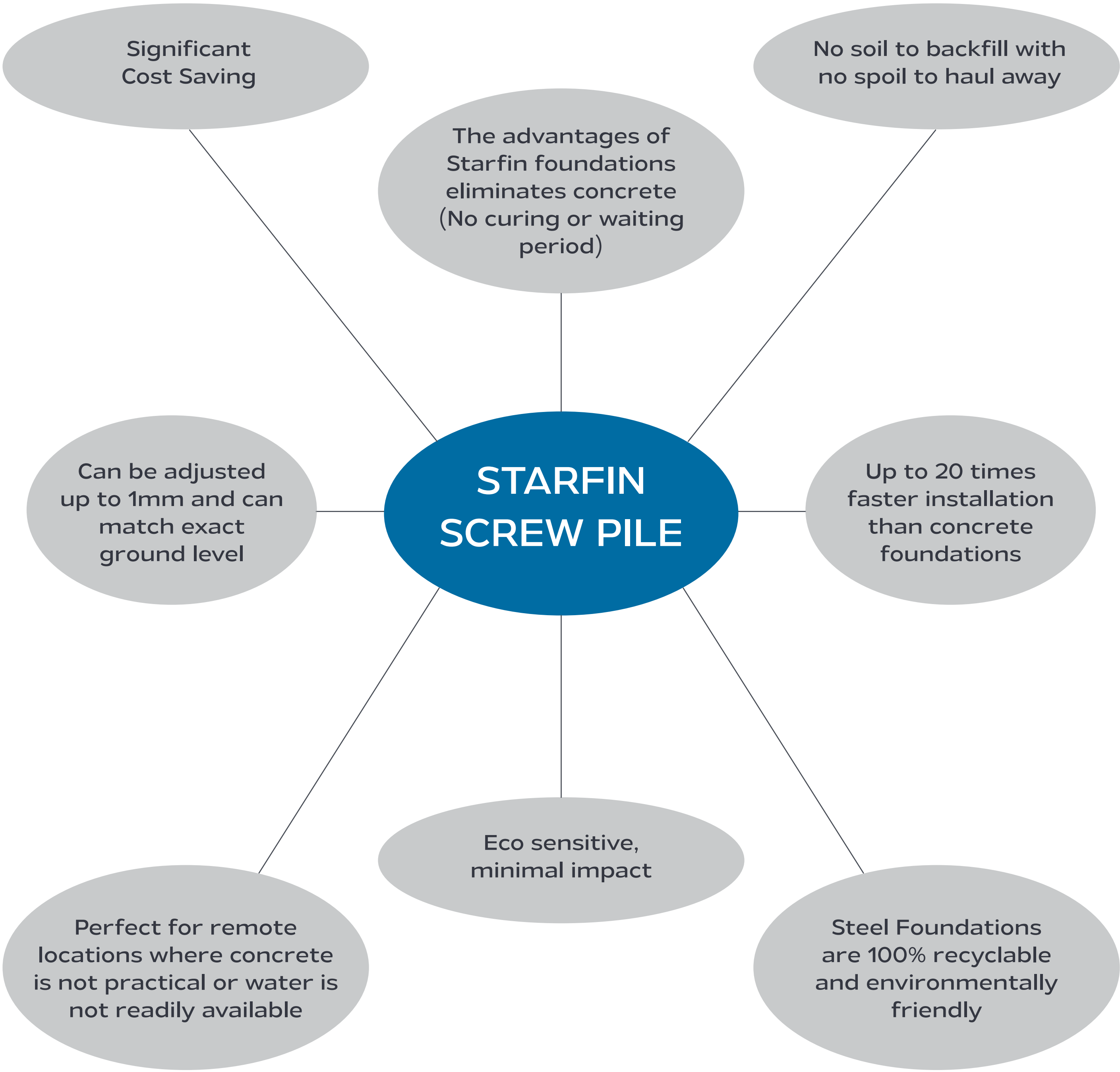
- Always check the drive tool for wear, replace if bent or out of shape.
- Check and confirm underground services and correct column set-out.
- Bolt the screw pile to drive tool (only used Gr8.8 bolts) and fix to kelly bar: ensure bolt heads will clear the fins during installation. Check to ensure that the fin assembly top swivel ring and drive plate interface is well greased.
- Manoeuvre the installation equipment to locate screw pile position, ensure hold down bolts are facing in the right direction, to suit the lighting column's base plate and orientation.
- Screw the shaft into the ground, approx. 300-500mm, stop and adjust the equipment to ensure vertical alignment of the screw pile shaft. Do not attempt to straighten the screw pile at any depth exceeding 600mm as this may result in the shaft bending.
- Apply constant downward pressure, rotation and alignment until the fin assembly is in contact with the ground; stop, remove any spoil and turn the fin assembly to ensure that the fins will not interfere with the cable entry slot's final position. *Note: location of cable slot indicator 'V' on drive plate.*
- If screw pile stalls during installation, firstly unwind screw pile until helix is near surface and re-install, if this fails after several attempts, remove screw pile altogether and pre drill with earth auger then reinstall screw pile.
- Continue the installation process until the screw pile drive plate is flush with the ground – ensure cable slot is facing towards junction box.
- Unbolt the drive tool from the screw pile.
- Stand up lighting column and fit to screw pile bolts.
- Level column by adjusting nuts up or down.
- Ensure future underground cable excavation will not interfere with fins.
- Always keep trench excavation to a minimum and re-compact soil on completion of cable laying.
- If after installation, soil around fin assembly is loose, compact loose soil with a crow bar head or vibration plate.

PRECAUTIONS

- Do not over torque screw pile during installation. If the ground is very hard always pre-drill as over torquing will cause the drive plate to shear off. This weak point is designed into the pile to limit damage to the pile shaft from over torquing.
- During installation ensure fins do-not rotate with screw pile shaft. The fin assembly is designed to be pulled into the ground vertically, any fin rotation in the ground may cause them to bend and render the screw pile unusable. Always check to ensure fin assembly top swivel ring and drive plate interface is well greased with anti-seize prior to installation.
- During screw pile installation always maintain a vertical position. Non vertical installation will damage the drive tool and possibly destroy the screw pile drive plate.
- Always ensure soil around fin assembly is well compacted after installation. Avoid creating a soil void for future water ponding.
- Star finned screw pile installation is limited to soil conditions which can be pre-augered. If preaugering is not possible the star finned product is not suitable for this location.



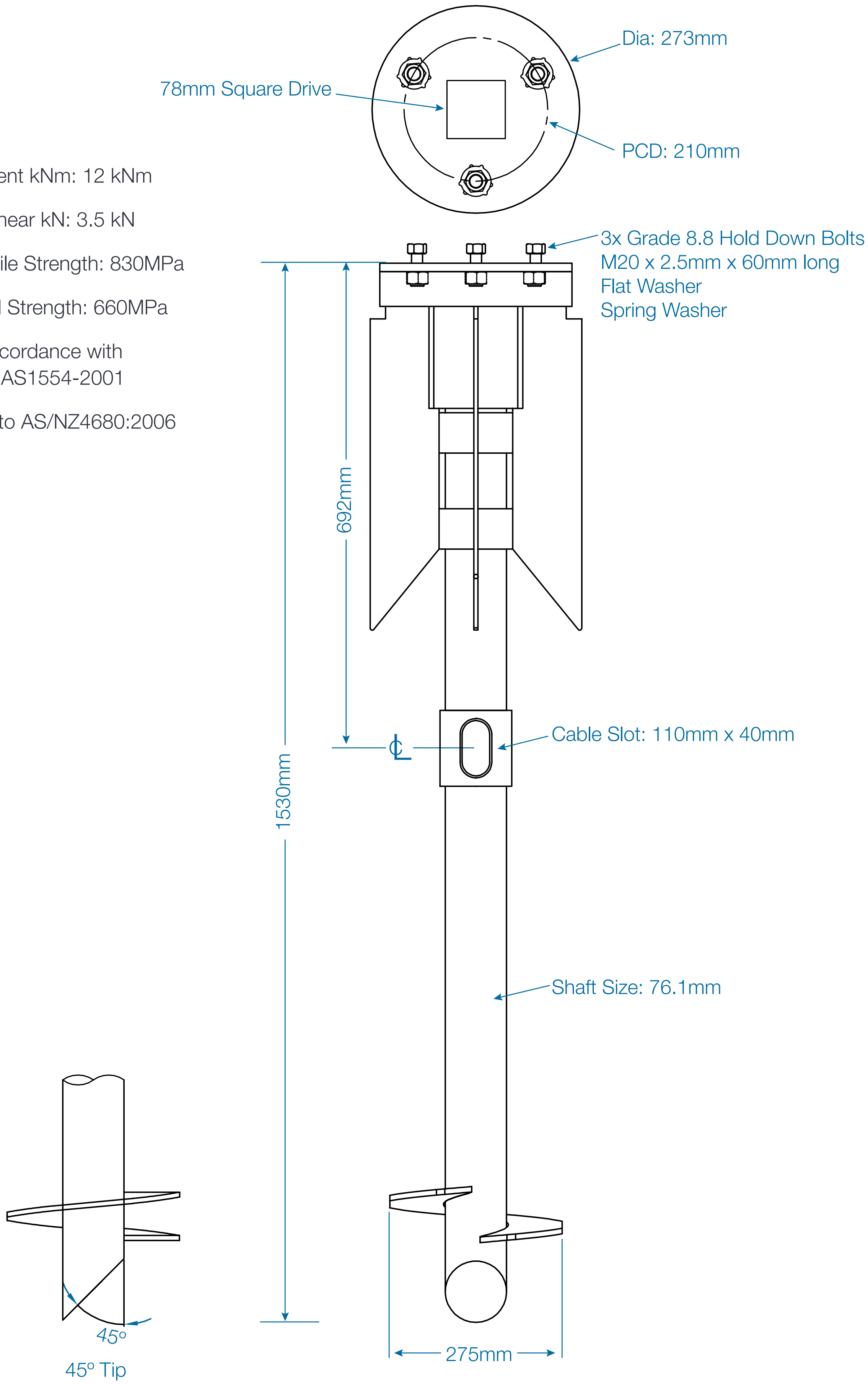
STARFIN SCREW PILE BENEFITS VERSUS BORED PILES



SF1 STARFIN ANCHOR

Specifications

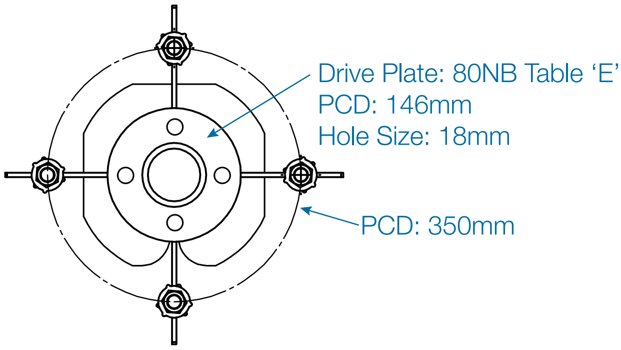
- 3 Fin Starfin Anchor
- Ultimate Base Moment kNm: 12 kNm
- Ultimate Capacity Shear kN: 3.5 kN
- Bolts Minimum Tensile Strength: 830MPa
- Bolts Minimum Yield Strength: 660MPa
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006
- Total Weight: 42kg

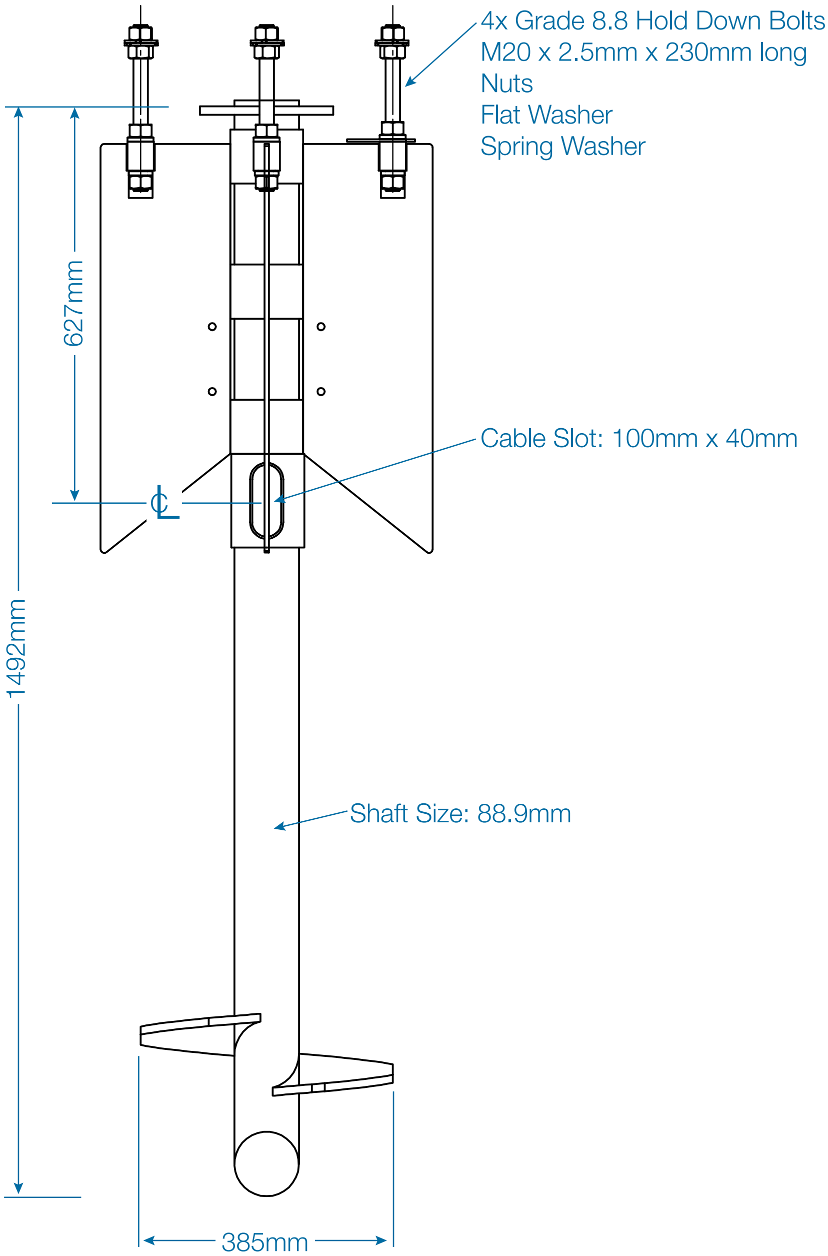


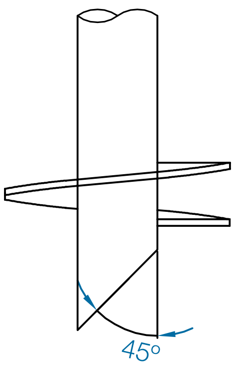
2B STARFIN ANCHOR

Specifications

- 4 Fin Starfin Anchor
- Ultimate Base Moment kNm: 17 kNm
- Ultimate Capacity Shear kN: 4.0 kN
- Bolts Minimum Tensile Strength: 830MPa
- Bolts Minimum Yield Strength: 660MPa
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006
- Total Weight: 57kg





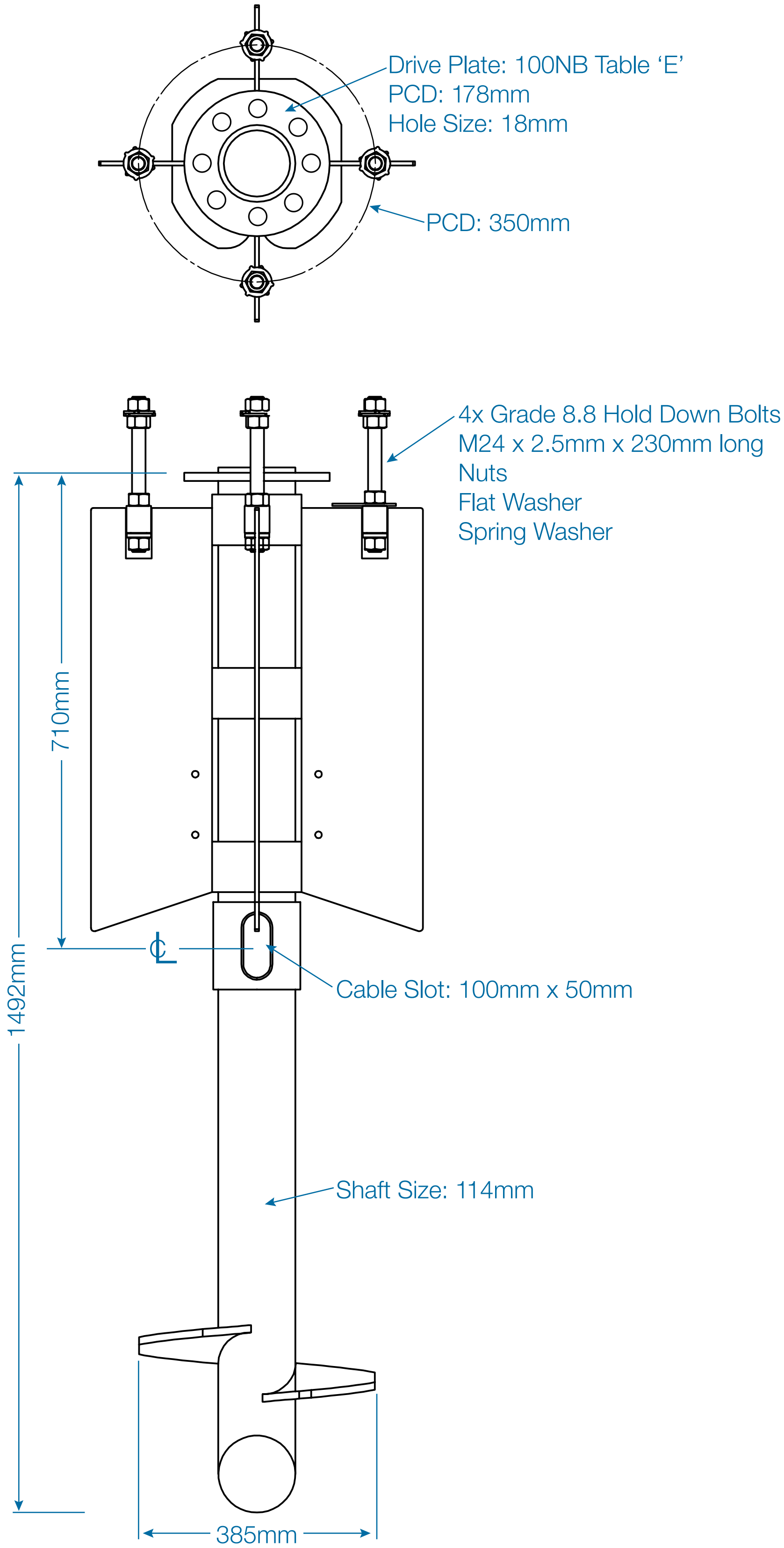


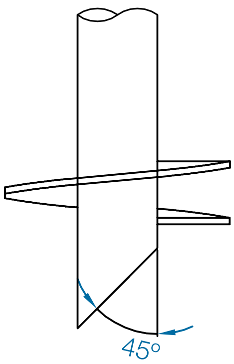
45º Tip

3B STARFIN ANCHOR

Specifications

- 4 Fin Starfin Anchor
- Ultimate Base Moment kNm: 32 kNm
- Ultimate Capacity Shear kN: 6.0 kN
- Bolts Minimum Tensile Strength: 830MPa
- Bolts Minimum Yield Strength: 660MPa
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006
- Total Weight: 71kg



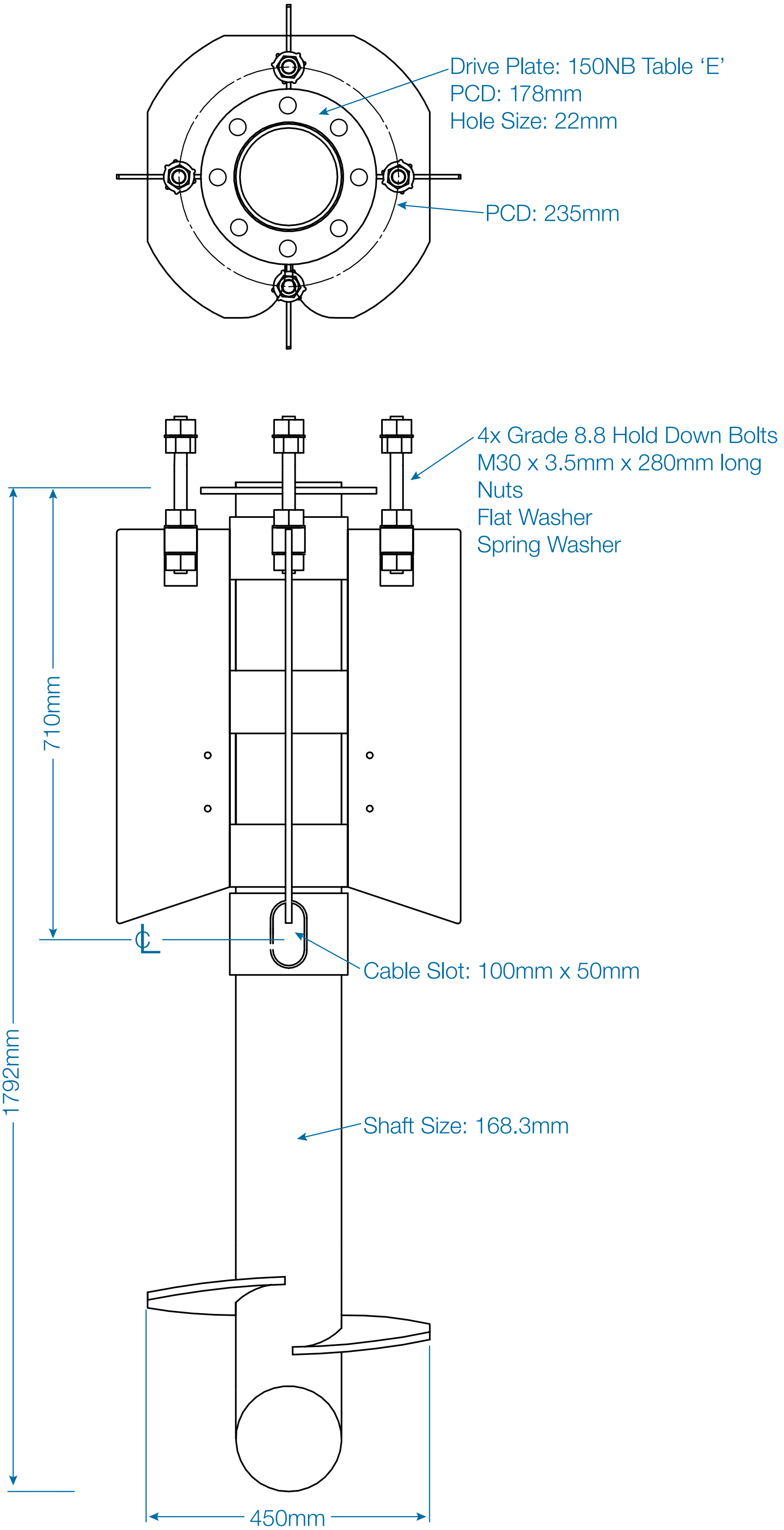


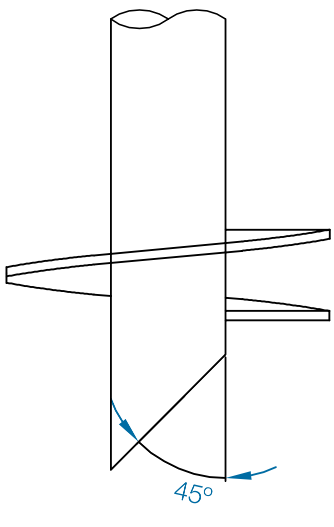
45º Tip

4A STARFIN ANCHOR

Specifications

- 4 Fin Starfin Anchor
- Ultimate Base Moment kNm: 39.2 kNm
- Ultimate Capacity Shear kN: 7.0 kN
- Bolts Minimum Tensile Strength: 830MPa
- Bolts Minimum Yield Strength: 660MPa
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006
- Total Weight: 101kg



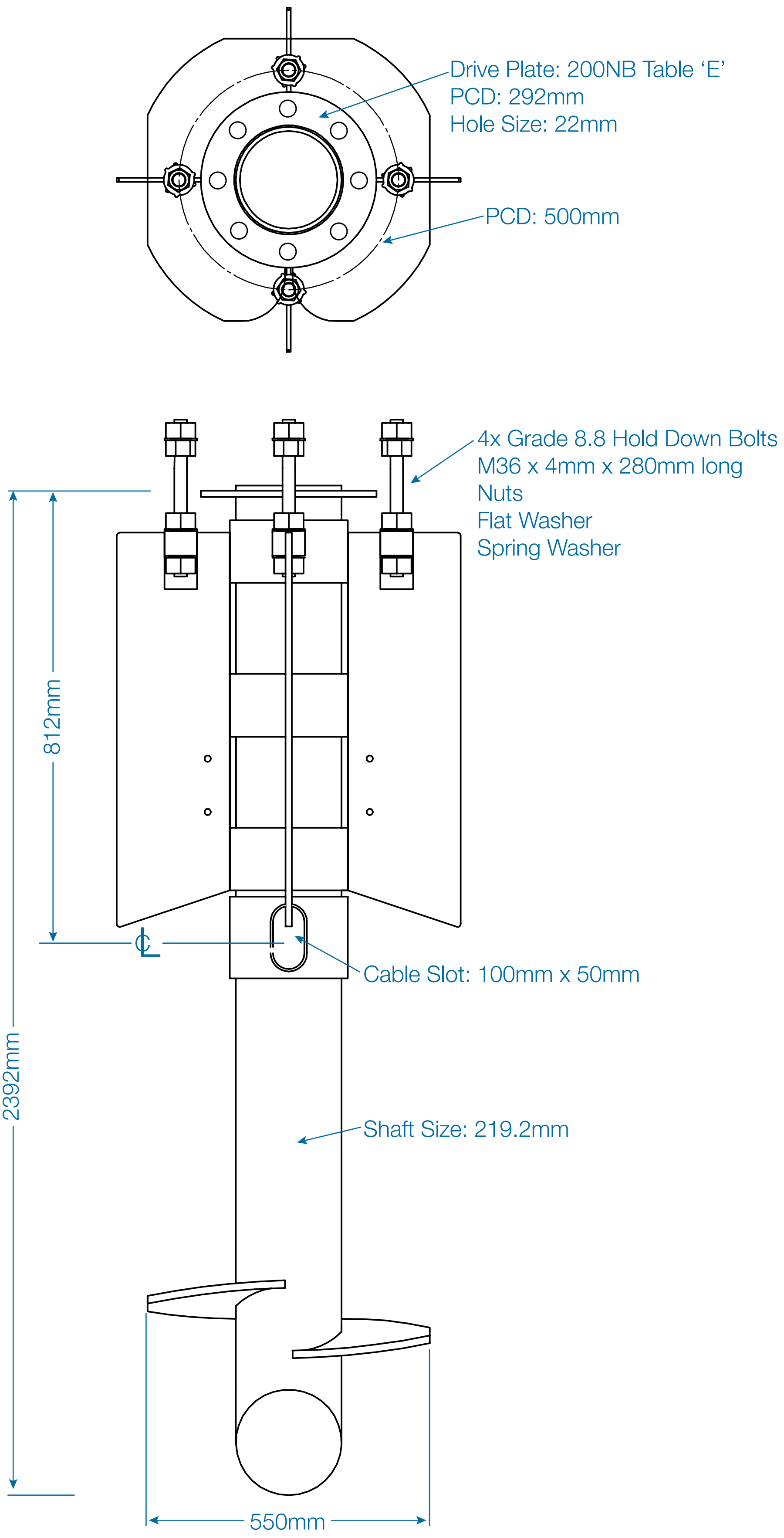


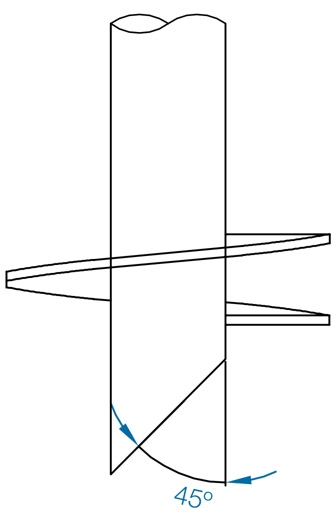
45º Tip

5A STARFIN ANCHOR

Specifications

- 4 Fin Starfin Anchor
- Ultimate Base Moment kNm: 70 kNm
- Ultimate Capacity Shear kN: 10.0 kN
- Bolts Minimum Tensile Strength: 830MPa
- Bolts Minimum Yield Strength: 660MPa
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006
- Total Weight: 176kg



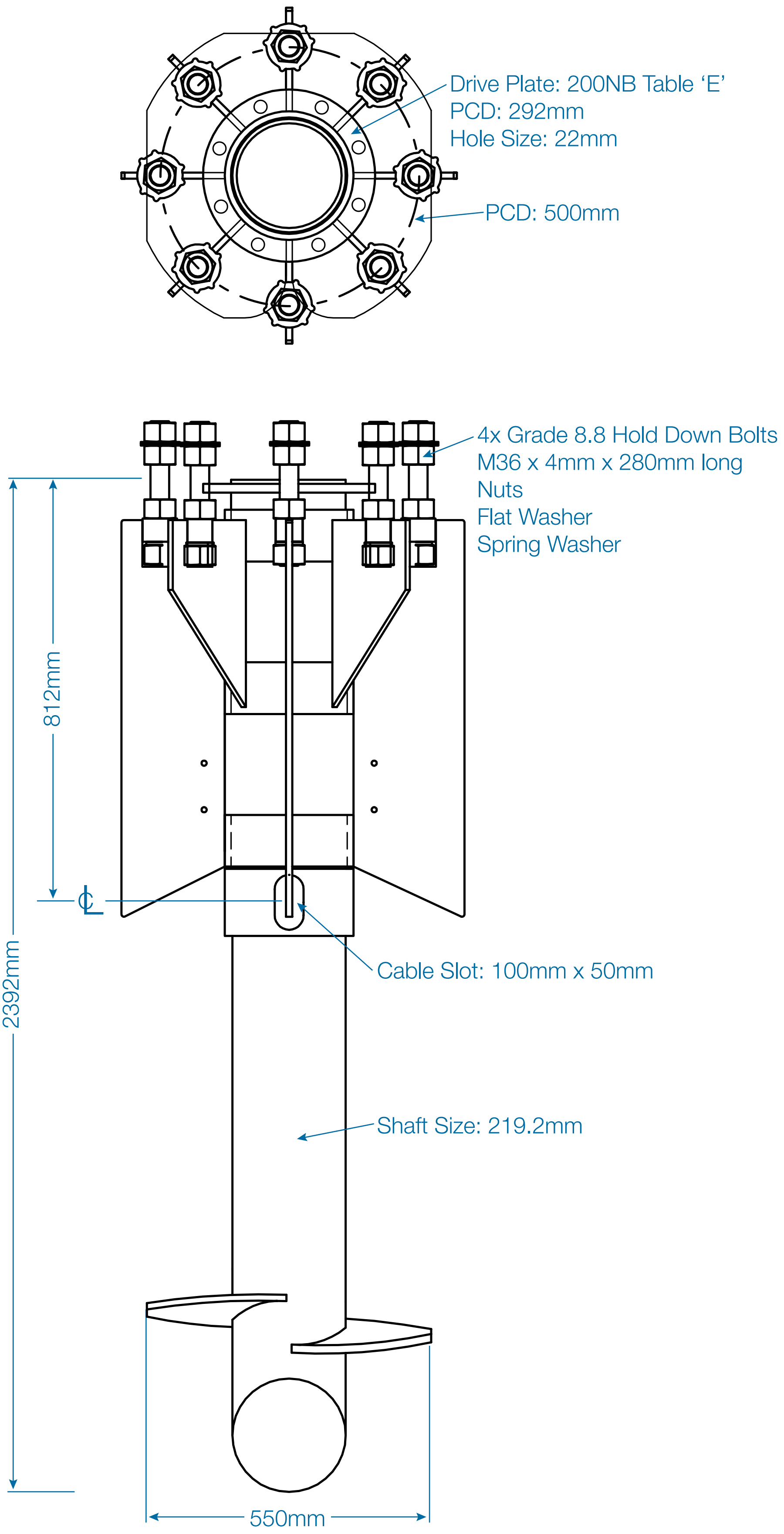


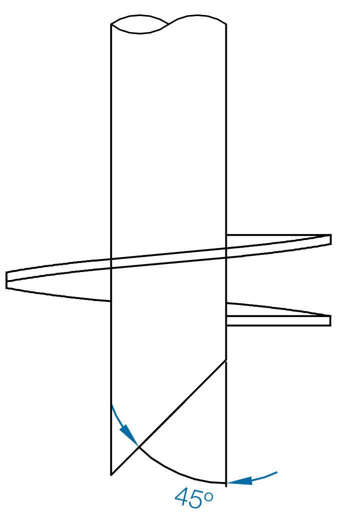
45° Tip

5B STARFIN ANCHOR

Specifications

- 8 Fin Starfin Anchor
- Ultimate Base Moment kNm: 80 kNm
- Ultimate Capacity Shear kN: 14.0 kN
- Bolts Minimum Tensile Strength: 830MPa
- Bolts Minimum Yield Strength: 660MPa
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006
- Total Weight: 217kg





45º Tip

RAG BOLT OVERVIEW

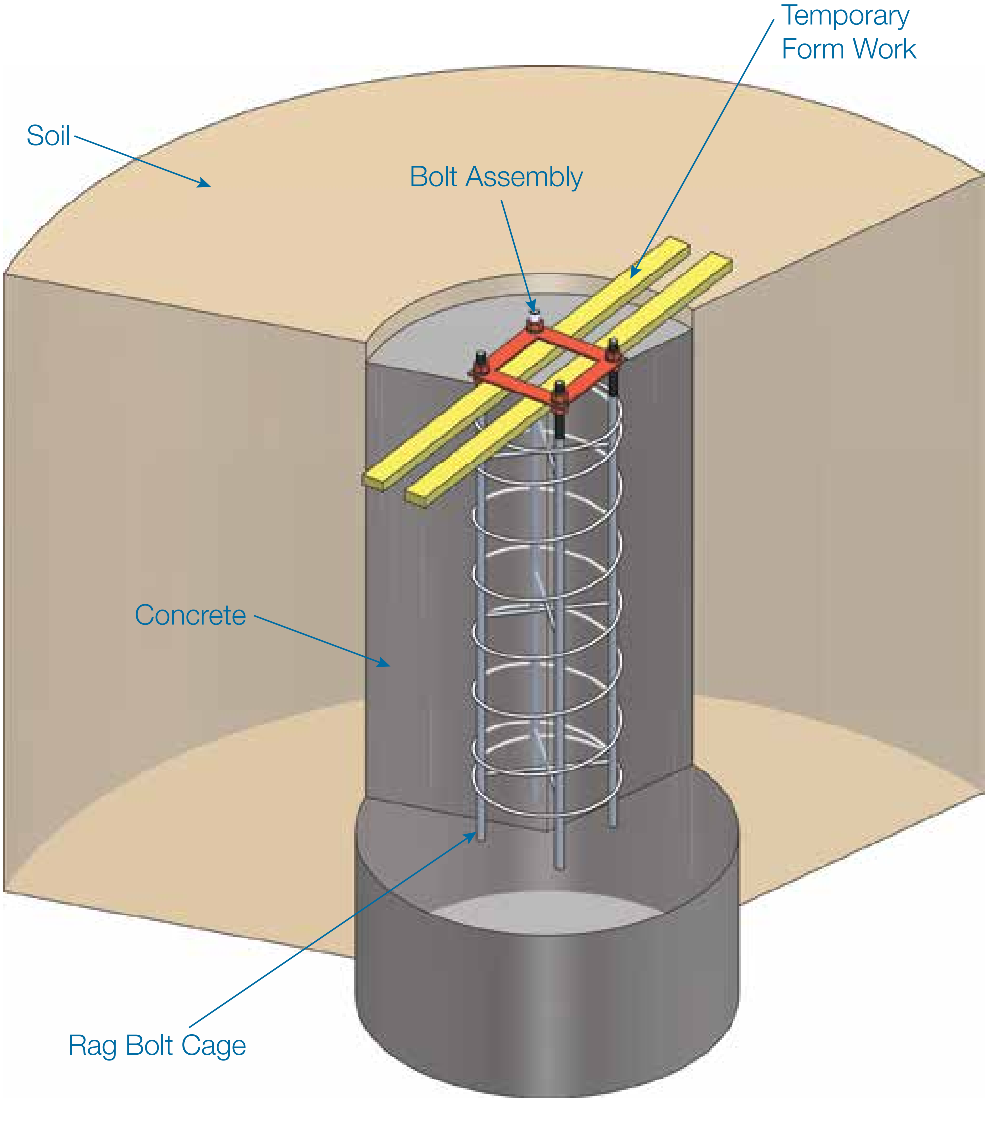
Rag Bolt Cage Equivalents

The Screw-in Star Fin system has significant advantages over bored concrete and cage installations. Some of these advantages are listed here however there are some geotechnical situations where the Star Fin is a less favourable option. For these situations we offer an alternative pre-manufactured galvanised cage for a concrete bored solution. These cages are designed with the equivalent loads to match the Star Fin series.

- The Pile Dia Min specified takes into account a minimum concrete cover of 50mm for non aggressive exposure conditions as well as the pile design loads. Other geotechnical, design and installation issues can affect and increase the required cover.
- Concrete placement should be a minimum of 32 Mpa. During placement the cage should either be shaken manually or limited vibrator use to ensure concrete flow around cage components. Excessive vibration may cause segregation of aggregate.
- Design loads are based on a Cu=50 for Cohesive soil. Each locations needs to be verified for suitability by a geotechnical engineer.
- For a sand environment a Starfin product is a better solution however if a bored pile cage design is essential a Medium Dense Sand foundation should be the minimum for consideration with an appropriate down grading of the ULS loads.
- The Soil Structure guide table on this drawing is not to replace the design requirements of a geotechnical report or appropriately qualified engineer.
- For multi pole applications field DCP test equipment is relatively low cost and simple to use as a method of verifying soil types combined with a site specific geotech report.
- The loads for each of these pile designs have been taken from the SFL/Piletech Starfin loadings as equivalents.

RAG BOLT SERIES	PCD mm	MASS kg	CAGE LENGTH "L" mm	MIN PILE/ HOLE DIA "D" mm	NO. OF BAR	APPROX. CAGE DIA "CD" mm	CONCRETE COVER "CC" mm	DIA. OF BAR/ THREAD SIZE "B" mm	ULS BASE BM KNm	ULS SHEAR KN	MIN DEPTH OF PILE "PD" mm
RB1	210	11.7	1200	400	3	250	75	20	12	3.5	1050
RB2B	350	19.5	1500	500	4	390	55	20	17	4	1350
RB3B	350	31.4	1800	500	4	394	53	24	32	6	1650
RB4A	350	51.8	1800	500	4	400	50	30	39	7	1650
RB5A	500	89.9	2400	750	4	556	97	36	70	10	2250

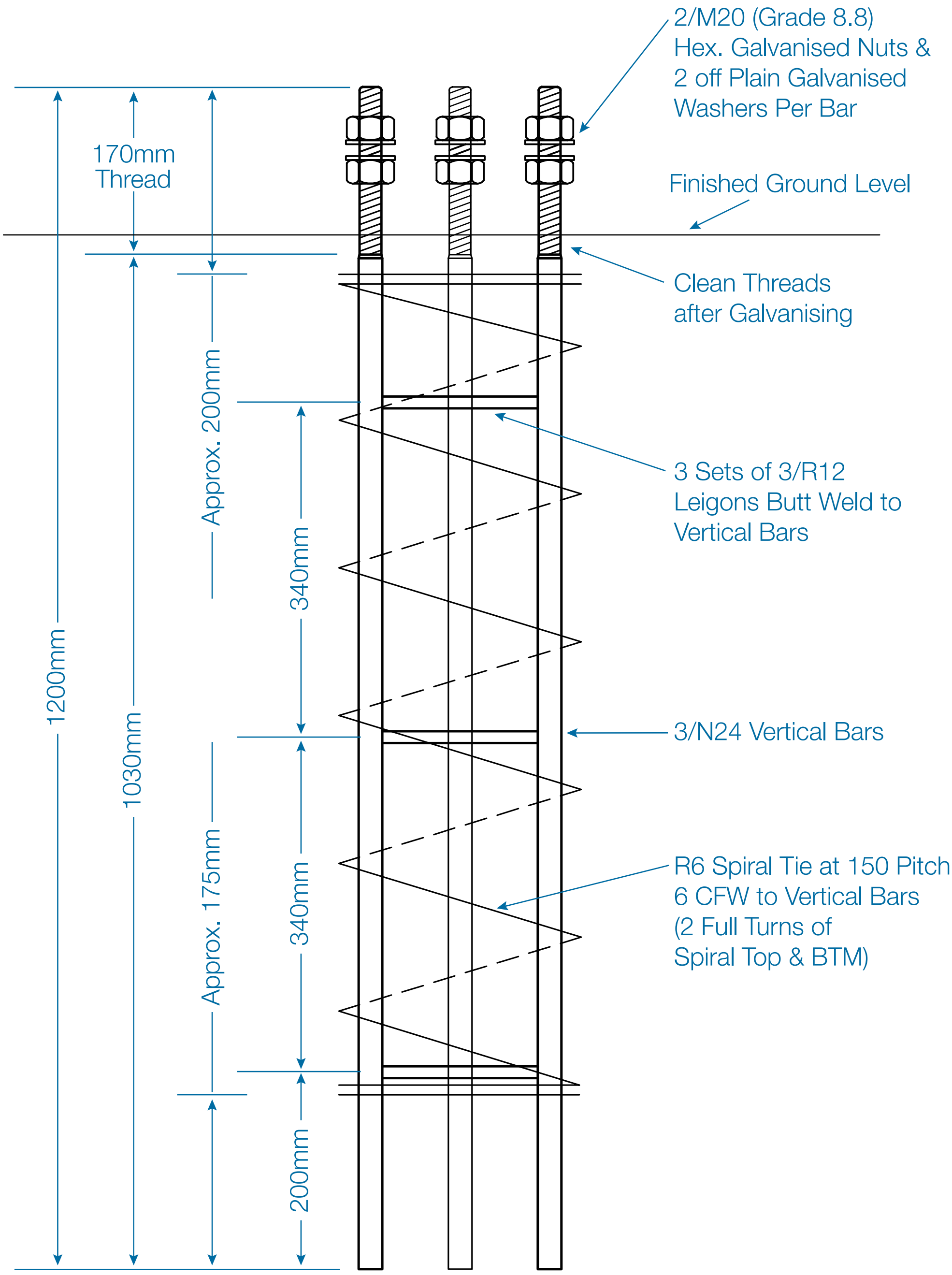
RAG BOLT PILE FOOTING

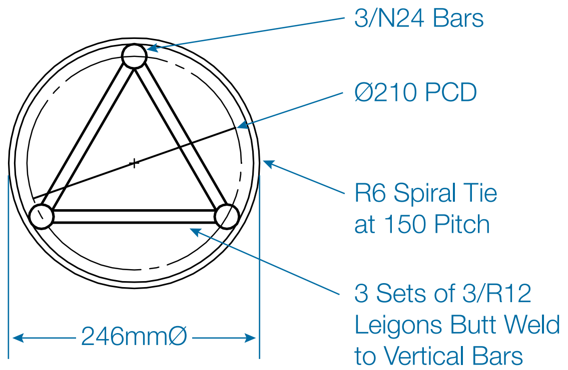


RB1 RAG BOLT

Specifications

- Ultimate Base Moment kNm: 12 kNm
- Ultimate Capacity Shear kN: 3.5 kN
- Nuts Minimum Tensile Strength: 830MPa
- Nuts Minimum Yield Strength: 660MPa
- Main Bar Specification AS 4671 Grade 500
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006

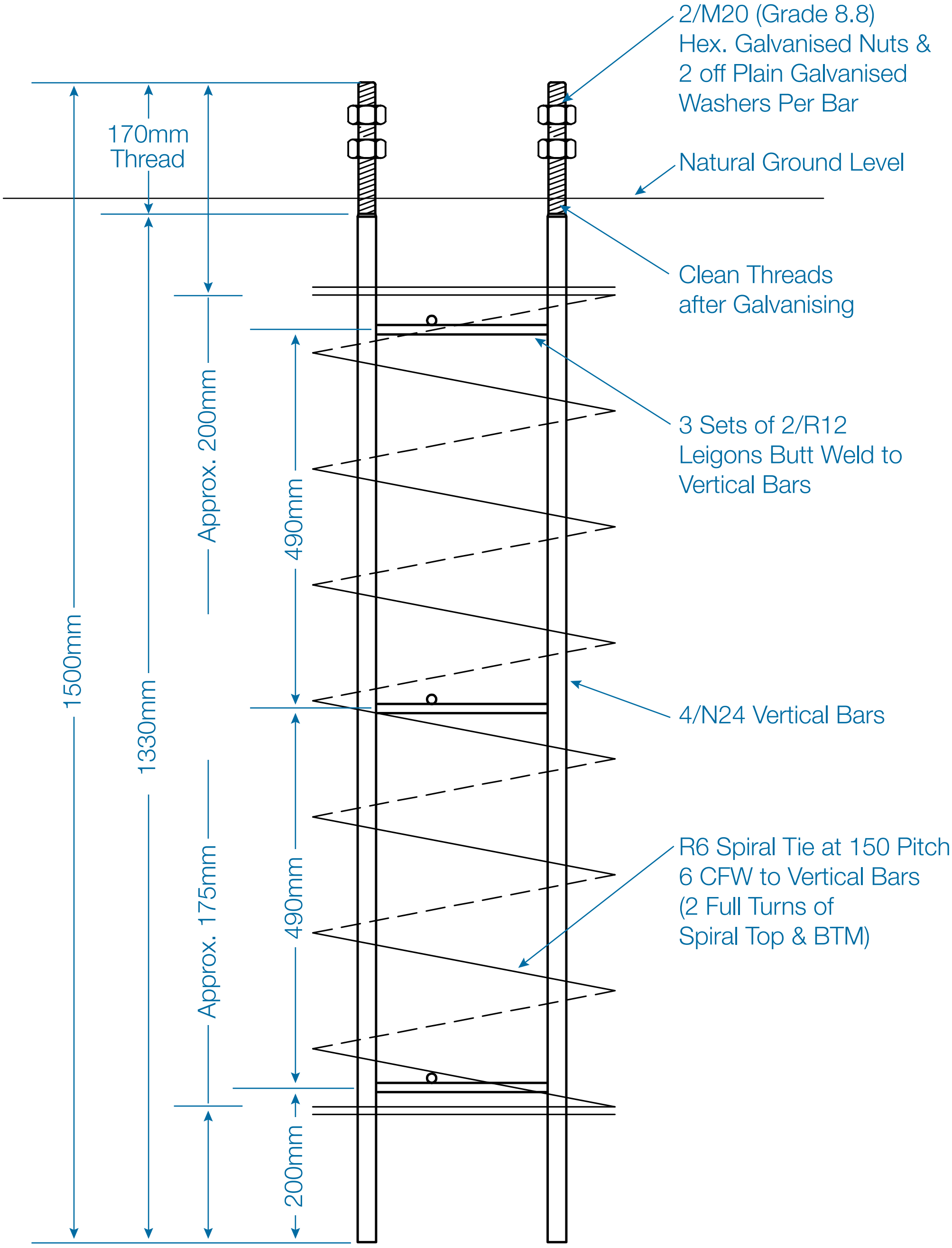


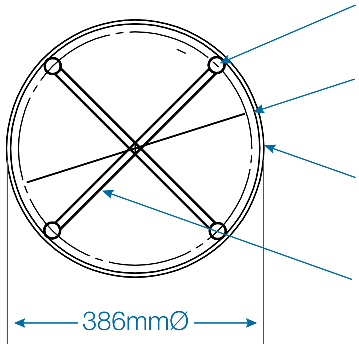


RB2B RAG BOLT

Specifications

- Ultimate Base Moment kNm: 17 kNm
- Ultimate Capacity Shear kN: 4 kN
- Nuts Minimum Tensile Strength: 830MPa
- Nuts Minimum Yield Strength: 660MPa
- Main Bar Specification AS 4671 Grade 500
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006

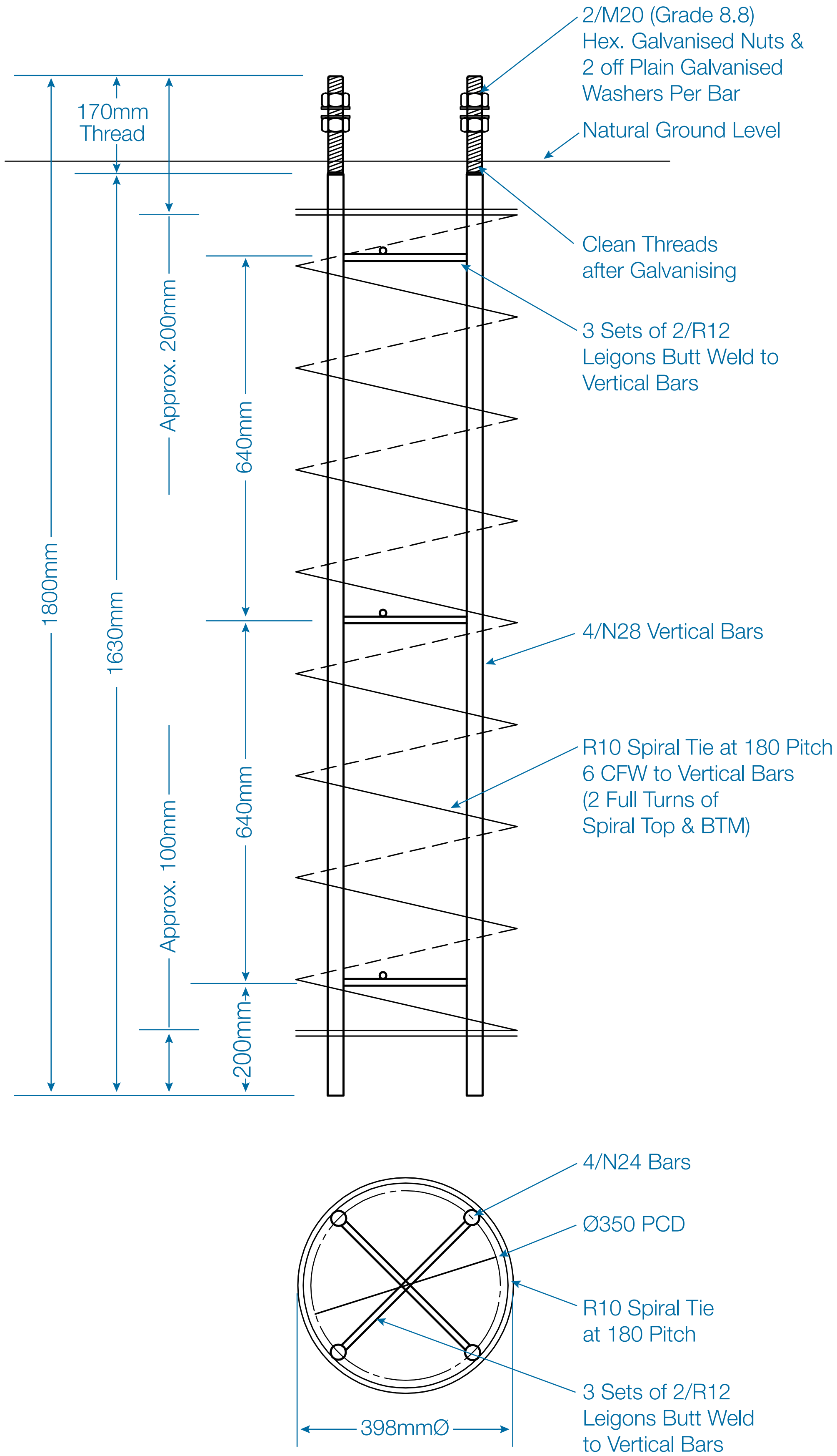




RB3B RAG BOLT

Specifications

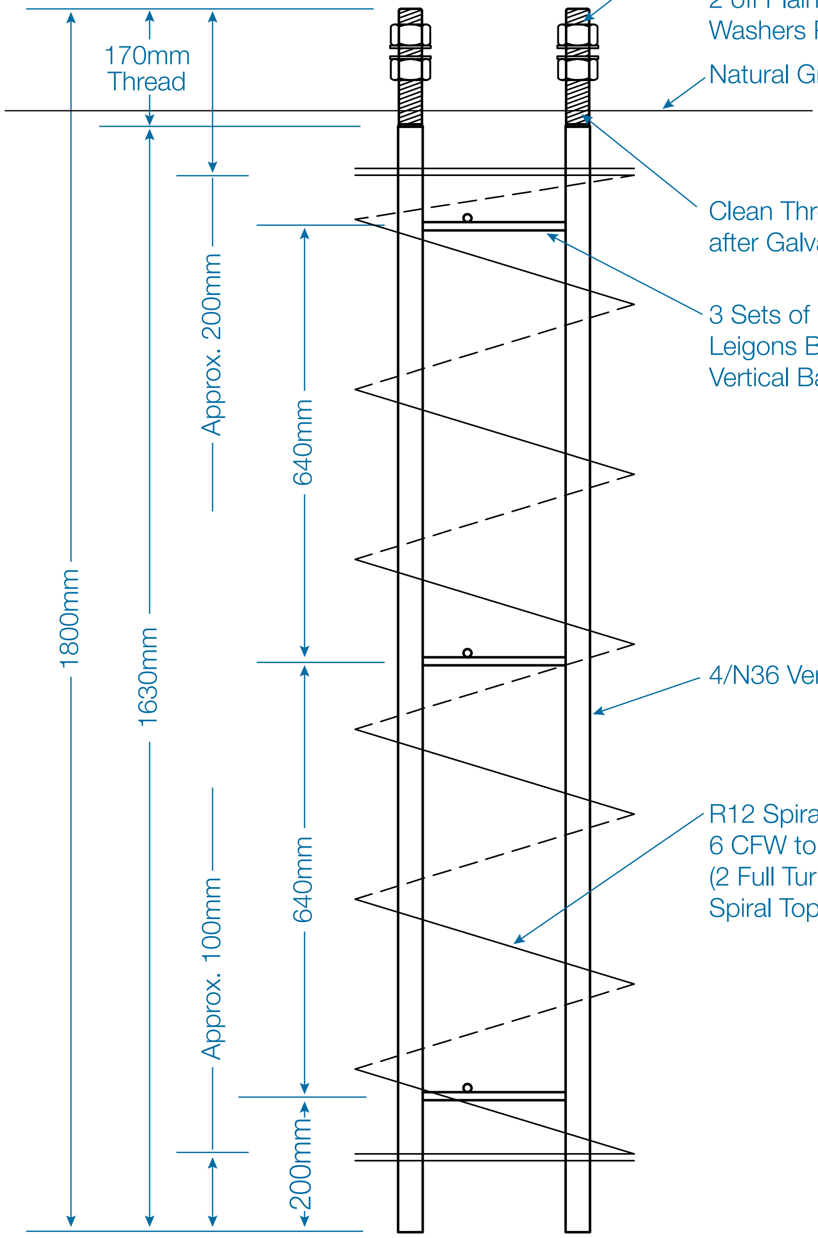
- Ultimate Base Moment kNm: 32 kNm
- Ultimate Capacity Shear kN: 6 kN
- Nuts Minimum Tensile Strength: 830MPa
- Nuts Minimum Yield Strength: 660MPa
- Main Bar Specification AS 4671 Grade 500
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006

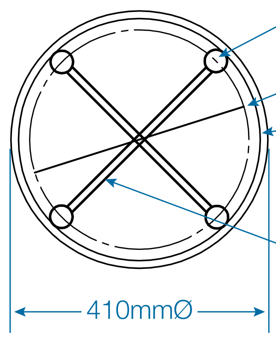


RB4A RAG BOLT

Specifications

- Ultimate Base Moment kNm: 39 kNm
- Ultimate Capacity Shear kN: 7 kN
- Nuts Minimum Tensile Strength: 830MPa
- Nuts Minimum Yield Strength: 660MPa
- Main Bar Specification AS 4671 Grade 500
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006

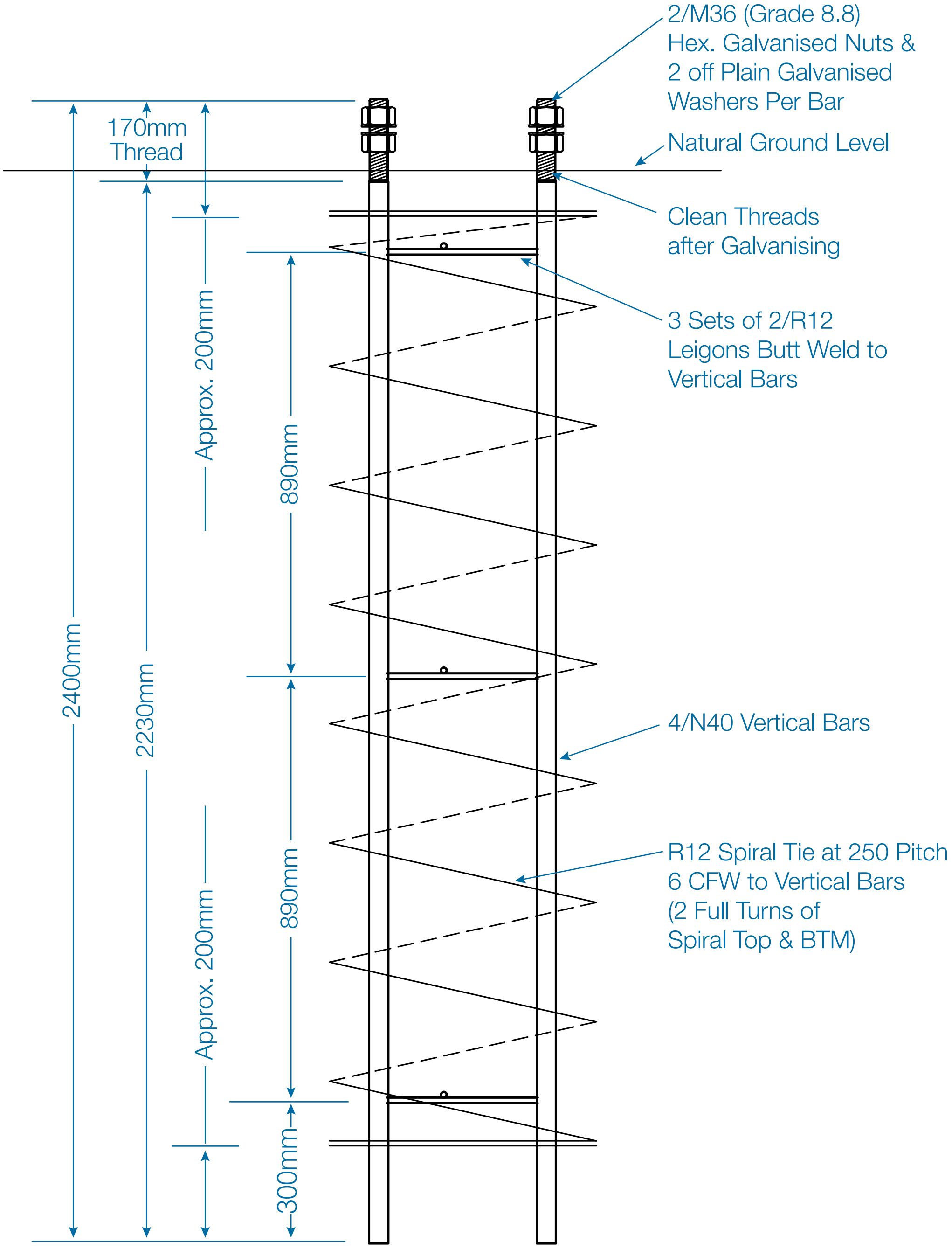


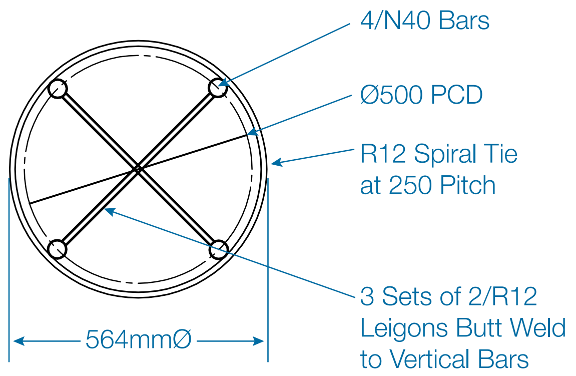


RB5A RAG BOLT

Specifications

- Ultimate Base Moment kNm: 70 kNm
- Ultimate Capacity Shear kN: 10 kN
- Nuts Minimum Tensile Strength: 830MPa
- Nuts Minimum Yield Strength: 660MPa
- Main Bar Specification AS 4671 Grade 500
- All welds to be in accordance with Australian Standard AS1554-2001
- Hot Dip Galvanised to AS/NZ4680:2006





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